Claims

1. A method of producing a polyuronic acid having an average degree of polymerization less than 20, comprising the steps:

(a) providing a solution containing 5 wt.% or more of a high molecular weight polyuronic acid predominantly as its lithium salt;

(b) adding hydrogen peroxide and a ferrous salt to the solution prepared in step (a) to oxidatively degrade the high molecular weight polyuronic acid; and

(c) isolating a polyuronic acid having an average degree of polymerization less than 20 obtained in step (b).

2. The method of Claim 1 wherein the acidic solution of step (a) has a pH value less than or equal to 5.0 or a pH value at which greater than or equal to 90% of the high molecular weight polyuronic acid is solubilized.

3. The method of Claim 1 wherein the hydrogen peroxide is added as an aqueous hydrogen peroxide solution.

4. The method of Claim 1 wherein the amount of hydrogen peroxide used is preferably in the range of 20 to 220 mole percent relative to the high molecular weight polyuronic acid.

5. The method of Claim 1 wherein the amount of the ferrous salt used is preferably in the range of 0.01 to 10 mole percent relative to the hydrogen peroxide.

6. The method of Claim 1 wherein the reaction in step (b) is an exothermic reaction and after completion of the exothermic reaction step (c) is implemented.

7. The method of Claim 1 wherein the step (c) comprises:

(c1) separating the solution containing the product polyuronic acids from insoluble iron products;

(c2) precipitating the product polyuronic acids from the solution prepared in step (c1); and

(c3) separating the precipitated polyuronic acids from the mixture prepared in step (c2).

8. The method of Claim 7 wherein the product polyuronic acids are precipitated from the solution prepared in step (c2) by one or a combination of the following methods:

(1) lowering the pH by addition of an acid,

(2) adding a low molecular weight carboxylic acid,

(3) adding a low molecular weight alcohol, or

(4) evaporating the liquid phase.

9. The method of Claim 8 wherein after addition of an acid the lowered pH value is less than or equal to 3.3.

10. The method of Claim 8 wherein the low molecular weight carboxylic acid is acetic acid, propionic acid or a mixture thereof.

11. The method of Claim 8 wherein the low molecular weight alcohol is one or more selected from the group consisting of methanol, ethanol, n-propanol, and isopropanol.

12. The method of Claim 1 wherein the high molecular weight polyuronic acid starting material has a weight average molecular weight less than or equal to 50,000 g/mole.

13. The method of Claim 1 wherein step (c) is omitted and the product is obtained as a solution containing predominantly polyuronic acids, having an average degree of polymerization less than 20 and, if necessary, insoluble iron products are removed therefrom.